

## Claims

We claim:

- 1 1. A method for communicating a bit stream using turbo coding comprising:  
2       encoding each input bit in the bit stream using a single  $1/3$  rate turbo  
3 encoder to produce a set of three bits for each input bit;  
4       repeating one of the three bits in each set to produce a set of four bits for  
5 each input bit;  
6       increasing a time interval between the four bits in the set before transmitting  
7 the set of four bits on a communications channel;  
8       decreasing the time interval between the set of four bits received via the  
9 communications channel;  
10       diversity combining the received set of four bits into a received set of three  
11 bits; and  
12       decoding each received set of three bits using a  $1/3$  rate turbo decoder to  
13 recover an output bit for each input bit.
- 1 2. The method of claim 1 wherein encoding uses two coders, each with a  $1/2$  rate  
2 turbo coder, and a first interleaver.
- 1 3. The method of claim 1 wherein one of the three bits is repeated in a cyclic  
2 manner.
- 1 4. The method of claim 1 wherein the time interval is increased with a second  
2 interleaver.

1 5. The method of claim 1 wherein the time interval between any two identical bits  
2 is larger than a channel coherent time.

1 6. The method of claim 1 wherein diversity combining uses selection diversity.

1 7. The method of claim 1 wherein diversity combining uses equal gain diversity.

1 8. The method of claim 1 wherein diversity combining uses maximum ratio  
2 combining.

1 9. The method of claim 1 wherein the decoding uses maximum a prior processes.

1 10. The method of claim 1 wherein the diversity combining is applied to the set of  
2 four received bits.

1 11. A system for communicating a bit stream using turbo coding comprising:  
2 a transmitter further comprising a single 1/3 rate turbo encoder configured to  
3 encode each input bit in the bit stream using to produce a set of three bits, a bit  
4 repeater configured to repeat one of the three bits in each set to produce a set of  
5 four bits for each input bit, and an interleaver configured to increase a time interval  
6 between the four bits in the set before transmitting the set of four bits on a  
7 communications channel; and

8 a receiver further comprising a de-interleaver configured to decrease the  
9 time interval between the set of four bits received via the communications channel,  
10 a diversity combiner configured to reduce the received set of four bits into a  
11 received set of three bits, and a single 1/3 rate turbo decoder configured to decode  
12 each received set of three bits to recover an output bit for each input bit.